TARGETED SAMPLING OF FISH SPECIES AT RISK IN LYONS AND TEA CREEKS, 2004

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by

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ABSTRACT

Marson, D., N.E. Mandrak, and D.A.R. Drake. 2009. Targeted sampling of fish species at risk in Lyons and Tea Creeks, 2004. Can. Manuscr. Rep. Fish. Aquat. Sci. 2910: iv + 18 p.

Observations by the Ontario Ministry of the Environment prompted a targeted sampling for the Threatened Lake Chubsucker (*Erimyzon sucetta*) in Lyons and Tea creeks by Fisheries and Oceans Canada in 2004. Sampling was conducted by backpack electrofishing (two sites), boat electrofishing (17 sites) straight seining (two sites), and fyke netting (three sites). Non-wadeable sites were sampled by boat electrofishing. All 24 sites were sampled between June 23, 2004 and August 11, 2004. A total of 578 fishes representing 28 species were caught, including two species at risk. The Lake Chubsucker (designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada [COSEWIC]) was collected at five sites, all sampled by boat electrofishing, and the Grass Pickerel (*Esox americanus vermiculatus*) (designated as Special Concern by COSEWIC) was collected from 10 sites, seven boat electrofishing sites, two backpack electrofishing sites, and one site sampled by seining. The collection of Lake Chubsucker in Lyons Creek represents an expansion of the known range. Lake Chubsucker was not collected in Tea Creek, where it has been collected in the past.

RÉSUMÉ

Marson, D., N.E. Mandrak, and D.A.R. Drake. 2009. Targeted sampling of fish species at risk in Lyons and Tea Creeks, 2004. Can. Manuscr. Rep. Fish. Aquat. Sci. 2910: iv + 18 p.

Des observations effectuées par le ministère de l'Environnement de l'Ontario ont incité l'échantillonnage ciblé du Sucet de Lac (*Erimyzon sucetta*) dans les ruisseaux Lyons et Tea par Pêches et Océans Canada en 2004. L'échantillonnage a été effectué à l'aide d'un appareil portatif de pêche à l'électricité (deux sites), de la pêche à l'électricité dans une embarcation (17 sites), de la pêche à la senne en ligne droite (deux sites) et de verveux (trois sites). Les sites non praticables à pied ont été échantillonnés avec la pêche à l'électricité dans une embarcation. Les 24 sites ont été échantillonnés entre le 23 juin 2004 et le 11 août 2004. Un total de 578 poissons représentant 28 espèces ont été attrapés, incluant deux espèces en péril. Le Sucet de Lac (désigné comme menacé par le Comité sur la situation des espèces en péril au Canada [COSEPAC]) a été recueilli à partir de cinq sites, tous échantillonnés par la pêche à l'électricité dans une embarcation, et le Brochet Vermiculé (*Esox americanus vermiculatus*) (désigné comme préoccupant par le COSEPAC) a été recueilli à partir de dix sites, dont sept sites par la pêche à l'électricité dans une embarcation, deux sites à l'aide d'un appareil portatif de pêche à l'électricité et un site par la pêche à la senne. La présence du Sucet de Lac dans le ruisseau Lyons représente une augmentation de l'étendue connue. Le Sucet de Lac n'a pas été recueilli dans le ruisseau Tea, où il a été recueilli dans le passé.

INTRODUCTION

Drainages in southwestern Ontario have been sampled periodically over the past few decades and records for many fish species at risk (SAR) exist for the region. Observations by the Ontario Ministry of the Environment in 2003 prompted the targeted sampling for the Threatened Lake Chubsucker (*Erimyzon sucetta*) in Lyons and Tea creeks by Fisheries and Oceans Canada in 2004. Targeted sampling refers to the non-random sampling of habitats, thought to contain "target species" based on previous sampling and known habitat preferences, using gears most likely to capture the target species. Sampling in 2004 occurred in both wadeable and non-wadeable habitats. Wadeable sites are defined as sites where the water depth is less than 1.5 m, stream flow is low, and substrates are stable. The wadeable sites were sampled by backpack electrofishing, 8.5 m straight seine, or by fyke netting. Non-wadeable sites were sampled by boat electrofishing. A total of 24 sites were sampled between June 23, 2004 and August 11, 2004 (Figure 1). Sites were selected based on accessibility and suitability of habitat for Lake Chubsucker. Lake Chubsucker has been captured in Tea Creek, in habitats with little flow, dense vegetation, and low turbidity (Mandrak et al. 2007).

METHODS

ELECTROFISHING SAMPLING

Backpack electrofishing was conducted using a Smith Root Model LR24 backpack unit. Sampling effort ranged from 567 to 1389 seconds of shocking at each site. Fishes were captured in nets as they were stunned and were placed in water-filled buckets. When electrofishing was completed, fishes were identified, measured and returned to the water. Voucher specimens of each species were preserved in 10% formalin for laboratory verification.

Boat electrofishing was conducted using a single boom, 4.57 m jon boat equipped with a Smith Root 5.0 GPP (gas powered pulsator) and a 5.0 kW generator. Sampling effort ranged from 89 to 2215 seconds of shocking at each site. A single netter retrieved fishes as they were stunned and transferred them into bins filled with water until sampling was completed at the site. The fishes were identified, measured, and returned to the water. Voucher specimens of each species were preserved in 10% formalin for laboratory verification.

FYKE NET SAMPLING

Fyke net sampling was performed using nets with 6.35 mm ace mesh, 15 cm inner hoop diameter, with wing lengths of 7.62 m and a lead length of 15.24 m. Fyke nets were set perpendicular to shore, with the lead set at the waters edge. The nets were set, left overnight, and fished the following day at approximately the same time (24 h sets). Effort was recorded as the difference between the start time (the time the net was set)

and the stop time (the time the net was retrieved). Fishes were transferred into bins filled with water. The fishes were identified, measured, and returned to the water. Voucher specimens of each species were preserved in 10% formalin for laboratory verification.

SEINE SAMPLING

Seining was performed using an 8.5 m straight seine with 6.35 mm ace mesh. Sampling effort ranged from two to seven hauls per site. Obstructions at certain sites limited the number of hauls, while additional sampling occurred at sites where new species were caught in successive hauls. Hauls were performed from upstream to downstream, in the direction of flow. Fishes were transferred from the seine net into bins filled with water. The fishes were identified, measured and returned to the water. Voucher specimens of each species were preserved in 10% formalin for laboratory verification.

HABITAT DATA COLLECTION

Habitat variables recorded at each site included air temperature (°C), water temperature (°C), conductivity (µS/cm), water depth (m), sampling depth (m), substrate components (% based on the Wentworth scale), aquatic vegetation (% emergent, % submergent, % floating), riparian vegetation (%), stream width (m), sampling distance from shore (m), habitat type (riffle, run, pool), and flow rate (none, slow, medium, fast).

RESULTS

ELECTROFISHING SAMPLING

Backpack Electrofishing

Two sites were sampled by backpack electrofishing. The backpack electrofishing sampling was conducted on June 24, 2004. The total backpack electrofishing effort was 1956 seconds, with Site 13 being shocked for 1389 seconds and Site 15 for 567 seconds. A total of 70 fishes representing 14 species were captured (Tables 1 and 2, Appendices 6 and 7). The mean catch per unit effort (CPUE) was 0.0358 fishes per second (Table 1). One species at risk, the Grass Pickerel, Special Concern, was caught at both backpack electrofishing sites; seven and four fish were caught from sites 13 and 15, respectively.

Boat Electrofishing

A total of 17 sites were sampled by boat electrofishing. Boat electrofishing sampling was conducted on June 23, June 24, and August 10, 2004. Total boat electrofishing effort was 11561 seconds with an average of 680.06 seconds per site (Table 1). A total of 433 fishes, representing 27 species were captured (Tables 1 and 2, Appendices 6

and 7). The mean CPUE was 0.0375 fishes per second. The minimum number of fishes captured was four (Site 2), and the maximum was 65 (Site 5). Two species at risk, the Lake Chubsucker (Threatened) and the Grass Pickerel (Special Concern), were captured while boat electrofishing.

FYKE NETTING

A total of three sites were sampled by fyke net. Fyke net sampling was conducted on August 11, 2004. The total effort was 72 hours, as each net was set for 24 hours (Table 1). Sampling resulted in the capture of 33 fishes, representing 8 species (Tables 1 and 2). The mean CPUE was 0.46 fish per hour. The minimum number of fishes captured was two (Site 21) and the maximum was 26 (Site 22). No species at risk were captured with fyke nets.

SEINING

Two sites were sampled by seining. Seining was conducted on June 25 and August 11, 2004. A total of nine hauls were performed at Sites 14 (2) and 24 (7). A total of 40 fishes representing seven species were captured (Tables 1 and 2). The mean CPUE was 4.44 fish per haul. Of the 40 fishes captured, 37 were caught at Site 14 (Appendix 6). A single Grass Pickerel was captured at Site 24.

HABITAT DATA

Sixteen of the 24 sites sampled in Lyons Creek had vegetative cover between 0 and 50%. Of the eight sites containing greater than 50% vegetation, only one site (Site 3) was 100% vegetated. Vegetation throughout the sites was composed of a relatively even balance of submergent and emergent vegetation. Stream depth ranged from 0.5 m to 4 m, with an average depth of 1.64 m. Sampling depth ranged from 0.4 m to 3 m depth, with an average sampling depth of 1.32 m.

Substrate was dominated by silt at seven sites (Sites 1-4, 6-8) and co-dominant with silt and organic matter at eight sites (Sites 16-21, 23, and 24). Clay was the dominant substrate at Site 13, gravel at Sites 12, 14, and 15, organic matter at Site 10, and sand at Site 11. Gravel and silt were co-dominant at Site 5 and sand and silt were co-dominant at Site 9. Substrate was not recorded at Site 22 (Appendix 4).

Water temperature and conductivity were only recorded at Sites 1-15. Water temperature varied from 18.1 to 23.5°C with an average of 21.4°C. Conductivity ranged from 125 to 172, with an average of 150.7 µS/cm.

DISCUSSION

Sampling of Lyons and Tea creeks in 2004 was conducted with the emphasis of locating the Threatened Lake Chubsucker. Targeted sampling was conducted using

backpack electrofishing, boat electrofishing, fyke netting and straight seining. By targeting habitats thought to contain Lake Chubsucker, Fisheries and Oceans Canada was successful in locating two species at risk, the Lake Chubsucker and the Grass Pickerel (Special Concern). The sampling of Lyons and Tea creeks resulted in the collection of 28 species, an additional 8 species from what was captured during sampling conducted between 1950 and 1996 by the Royal Ontario Museum (Appendices 7 and 8). The Black Bullhead, Common Shiner, Greater Redhorse, Mimic Shiner, Rainbow Darter, and Yellow Bullhead were not captured in the 2004 study but had been previously documented in Lyons and Tea creeks.

Targeted sampling for Lake Chubsucker concentrated on the preferred habitat characteristics noted in the updated COSEWIC status report: habitats with little flow, dense vegetation, and low turbidity (Mandrak et al. 2007). Lake Chubsucker were captured at five sites (16-20), characterized by high water clarity, pools with no flow, and moderate vegetation cover (40-50%). All five sites were composed of an equal mix of organic and silt substrate. Although Lake Chubsucker is previously known from Tea Creek (Mandrak et al. 2007), a tributary to Lyons Creek, it was not collected in Tea Creek during this study. Additional sampling in Tea Creek is suggested, since only four sites were sampled due to time constraints. Lake Chubsucker was not found previously in Lyons Creek, indicating an expansion of the known range for this species.

Grass Pickerel were captured at 10 sites (6, 8, 9, 13, 15-18, 20, 24). Seven of the 10 sites were at least 50% vegetated with a mix of emergent and submergent vegetation. Sites 13 and 15 were the least vegetated sites with only 25% vegetative cover. Interestingly, the only site with floating vegetation, Site 13, had the highest catch of Grass Pickerel (n = 7). Although it may seem that Grass Pickerel prefer the floating vegetation, the increased catch might simply be a result of an increased catchability when backpack electrofishing, as the two backpack electrofishing sites (13 and 15) had the highest catches of Grass Pickerel (7 and 4, respectively) at all of the Lyons and Tea creeks sites. The substrate at seven of the 10 sites was composed of a combination of organic matter and silt. The Grass Pickerel has been well documented within many of the tributaries to the Upper Niagara and Welland rivers (Crossman and Holm 2005) and was therefore, not an unexpected discovery. This study highlights the effectiveness of targeted sampling in locating species of interest.

ACKNOWLEDGEMENTS

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Table 1. Summary of sampling effort during 2004 Lyons Creek sampling.

Catch Data and Sampling Effort	BEF	BPEF	Fyke net	Seine	Combined
Total Fish Captured	433	70	33	40	576
Species Richness	27	14	8	7	28
Fish SAR Detected	2	1	0	1	2
Unique Species	11	0	0	0	11
Total Effort (seconds, hours, hauls)	11561s	1956s	72h	9 hauls	
Mean Effort (seconds, hours, hauls)	680.06s	978s	24h	4.5 hauls	
Mean CPUE (fish/sec, fish/haul)	0.0375	0.0358	0.46/hr	4.44	

BEF – Boat electrofishing; BPEF – Backpack electrofishing

Table 2. Summary of species captured during the 2004 Lyons Creek sampling by boat electrofishing (BEF), backpack electrofishing (BPEF), fykenetting, and straight seining. See Appendix 6 for a list of the scientific and common names.

Common Name	BEF	BPEF	Fykenet	Seine	Total
Black Crappie	2		2		**4**
Bluegill	21			1	**22**
Bluntnose Minnow	56				**56**
Bowfin	5	2			**7**
Brown Bullhead	2	1	1	1	**5**
Central Mudminnow	5	1			**6**
Common Carp	5				**5**
Emerald Shiner	33				**33**
Fathead Minnow	6				**6**
Golden Redhorse	2				**2**
Golden Shiner	79	1	4		**84**
Goldfish	15				**15**
Grass Pickerel **(SC)**	12	11		1	**24**
Green Sunfish	1	8	2	5	**16**
Johnny Darter	3	1			**4**
Lake Chubsucker **(TH)**	5				**5**
Largemouth Bass	46	1	1	1	**49**
Northern Pike	4	3			**7**
Esox Sp	1				**1**
Pumpkinseed	97	28	18	30	**173**
Rock Bass	3	5			**8**
Rudd	2				**2**
Spottail Shiner	7				**7**
Striped Shiner	6	3			**9**
Tadpole Madtom		1	4		**5**
White Crappie	2				**2**
White Sucker	2	4	1		**7**
Yellow Perch	11			1	**12**
Total	**433**	**70**	**33**	**40**	**576**

* COSEWIC Status: SC – Special Concern; TH – Threatened

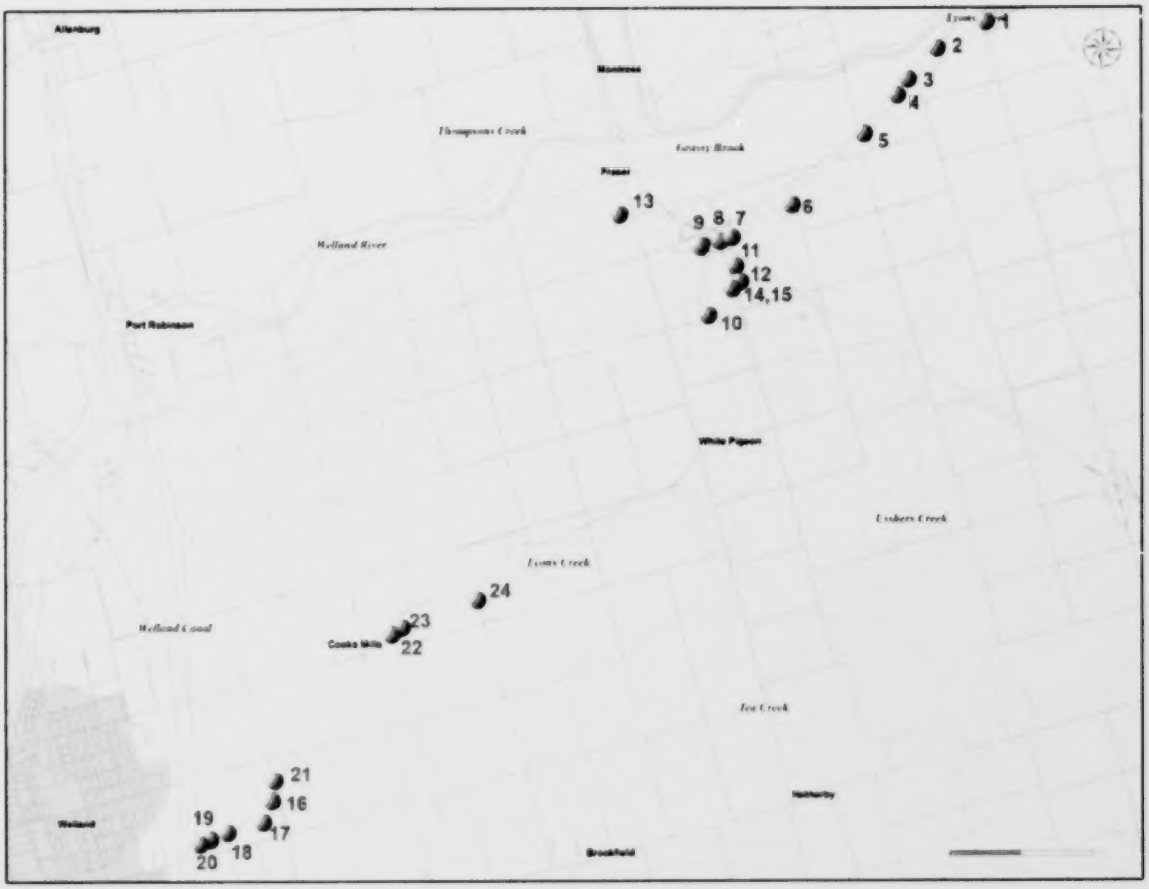

Figure 1. Site sampled in Lyons and Tea creeks in 2004. Map # corresponds to numbers in appendices. See Appendix 1 for detailed site descriptions.

Appendix 1. Site location data for 2004 Lyons Creek sampling. Map # corresponds to Figure 1.

Map#	Date	Waterbody Name	Narrative Locality Description	Start Latitude	Start Longitude
1	23/06/2004	Lyons Creek	200 m downstream of Sodom Rd., along N bank	43.04800034	-79.0658417
2	23/06/2004	Lyons Creek	200 m upstream of Beck Rd., south side	43.0471611	-79.0668182
3	23/06/2004	Lyons Creek	200 m N of housing row, S bank, upstream of Beck Rd.	43.04415894	-79.0729218
4	23/06/2004	Lyons Creek	Shock 200 m opposite end of site 003 (N bank), accessed above Beck Rd.	43.04317093	-79.0755386
5	23/06/2004	Lyons Creek	200 m up and downstream of Stanley Ave bridge, N and S banks	43.03936005	-79.0822296
6	23/06/2004	Lyons Creek	200 m upstream and downstream from Beck Rd., N and S bank	43.03339005	-79.0973587
7	23/06/2004	Lyons Creek	200 m upstream and downstream of QEW bridge, N and S side	43.03131104	-79.1083832
8	24/06/2004	Lyons Creek	100 m downstream of QEW, N and S bank	43.03134137	-79.1104184
9	24/06/2004	Lyons Creek	200 m upstream from upper QEW merge ramp, both banks sampled (N & S)	43.03133011	-79.1127777
10	24/06/2004	Lyons Creek	200 m upstream of McCredie Rd. access point (seen on N	43.02286148	-79.1147614
11	24/06/2004	Tea Creek	200 m upstream and downstream of QEW bridge, both sides shocked	43.02809906	-79.1088333
12	24/06/2004	Tea Creek	100 m downstream of Schister Rd. bridge	43.02608109	-79.108963
13	25/06/2004	Lyons Creek	150 m upstream and downstream of Montrose Rd. bridge	43.03760376	-79.1246951
14	25/06/2004	Tea Creek	100 m upstream and downstream of Willodell Rd.	43.02542877	-79.1097183
15	25/06/2004	Tea Creek	100 m upstream and downstream of Willodell Rd.	43.02542877	-79.1097183
16	10/08/2004	Lyons Creek	Between 0-500 m upstream of Rd. 140, shocking 4 transects	42.97943115	-79.2059097
17	10/08/2004	Lyons Creek	Shocking between 500-850 m upstream of Rd. 140 crossing/culvert	42.97705078	-79.2083435
18	10/08/2004	Lyons Creek	Shocking between 900-1200 m upstream of Rd. 140 (culvert), two shocking passes	42.97660828	-79.2142868
19	10/08/2004	Lyons Creek	Between 1250-1500 m upstream of Rd. 140, shocking two passes within the stretch	42.9767189	-79.2174301
20	10/08/2004	Lyons Creek	Shocking between 1500-1800 m upstream of Rd. 140 culvert, making two passes between boundaries	42.97624969	-79.2183304
21	11/08/2004	Lyons Creek	Hoopnet set immediately downstream of highway 140 culvert	42.98115921	-79.2046509
22	11/08/2004	Lyons Creek	Immediately upstream of Pearson Rd. bridge	42.99530029	-79.1790619
23	11/08/2004	Lyons Creek	100 m downstream of Pearson Rd. bridge	42.99571991	-79.1780014
24	11/08/2004	Lyons Creek	Immediately upstream and downstream of Broland Ave. bridge	42.99654007	-79.164299

Appendix 2. Description of sampling methods for 2004 Lyons Creek sampling. Map # corresponds to Figure 1.

Map#	Date	Waterbody Name	Capture Method	Duration	Effort	Description of Method
1	23/06/2004	Lyons Creek	BEF	183	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
2	23/06/2004	Lyons Creek	BEF	175	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
3	23/06/2004	Lyons Creek	BEF	340	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
4	23/06/2004	Lyons Creek	BEF	377	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
5	23/06/2004	Lyons Creek	BEF	997	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
6	23/06/2004	Lyons Creek	BEF	932	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
7	23/06/2004	Lyons Creek	BEF	867	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
8	24/06/2004	Lyons Creek	BEF	295	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
9	24/06/2004	Lyons Creek	BEF	327	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
10	24/06/2004	Lyons Creek	BEF	330	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
11	24/06/2004	Tea Creek	BEF	1068	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
12	24/06/2004	Tea Creek	BEF	89	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
13	25/06/2004	Lyons Creek	BPEF	1389	Seconds	Backpack Electrofishing Unit
14	25/06/2004	Tea Creek	Seine Net	2	Haul	Straight Seine 6.35 mm ace mesh, Length - 8.5 m
15	25/06/2004	Tea Creek	BPEF	567	Seconds	Backpack Electrofishing Unit
16	10/08/2004	Lyons Creek	BEF	2215	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
17	10/08/2004	Lyons Creek	BEF	897	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
18	10/08/2004	Lyons Creek	BEF	791	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
19	10/08/2004	Lyons Creek	BEF	786	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
20	10/08/2004	Lyons Creek	BEF	892	Seconds	Efishing Boat, Small - 4.57 m, 5.0 GPP, single boom
21	11/08/2004	Lyons Creek	FN Small	24	Hours	Fyke net, Small 64 mm mesh
22	11/08/2004	Lyons Creek	FN Small	24	Hours	Fyke net, Small 64 mm mesh
23	11/08/2004	Lyons Creek	FN Small	24	Hours	Fyke net, Small 64 mm mesh
24	11/08/2004	Lyons Creek	Seine Net	7	Haul	Straight Seine 6.35 mm ace mesh, Length - 8.5 m

Appendix 3. Summary of aquatic vegetation data for 2004 Lyons Creek sampling. Map # corresponds to Figure 1. na – not available

Map#	Stream Width (m)	Stream Depth (m)	Distance From Shore (m)	Max Sample Depth (m)	Aquatic Veg Type1	Aquatic Veg 1 (%)	Aquatic Veg Type2	Aquatic Veg 2 (%)	Aquatic Veg Type3	Aquatic Veg 3 (%)	Aquatic Veg Type4	Aquatic Veg 4 (%)
1	50	2	2	1	None	70	Emergent	20	Submergent	10		0
2	40	3	3	2	Submergent	40	None	40	Emergent	20		0
3	50	4	4	1	Submergent	50	Emergent	50		0		0
4	60	3	4	2	None	60	Submergent	20	Emergent	20		0
5	60	4	3	2	None	50	Submergent	30	Emergent	20		0
6	60	2	4	1.5	Emergent	40	Submergent	30	None	30		0
7	40	3	4	3	Emergent	40	Submergent	40	None	20		0
8	40	2	40	2	Submergent	40	None	40	Emergent	20		0
9	45	2	2	2	None	50	Submergent	30	Emergent	20		0
10	20	1	20	1	None	60	Submergent	30	Emergent	10		0
11	15	1	2	1	None	80	Submergent	10	Emergent	10		0
12	10	1	10	1	None	75	Submergent	15	Emergent	10		0
13	5	1	5	1	None	75	Emergent	10	Floating	10	Submergent	5
14	20	1	20	1	None	75	Emergent	10	Submergent	15		0
15	20	1	20	1	None	75	Emergent	10	Submergent	15		0
16	150	0.67	na	na	None	50	Emergent	25	Submergent	25		
17	150	0.5	na	na	None	50	Emergent	25	Submergent	25		0
18	100	0.6	na	0.6	None	50	Emergent	25	Submergent	25		0
19	65	0.75	na	0.4	None	50	Emergent	25	Submergent	25		0
20	50	0.7	na	0.7	None	60	Submergent	25	Emergent	15		0
21	50	1	na	1	None	50	Emergent	25	Submergent	25		0
22	no data collected											
23	50	1	na	1	None	40	Submergent	30	Emergent	30		0
24	30	1.5	na	1.5	None	40	Submergent	30	Emergent	30		0

Appendix 4. Summary of substrate data for 2004 Lyons Creek sampling. Map # corresponds to Figure 1. na – not available

Map#	Substrate 1	Substrate 1 (%)	Substrate 2	Substrate 2 (%)	Substrate 3	Substrate 3 (%)	Substrate 4	Substrate 4 (%)	Habitat Type	Flow Rate
1	Silt	80	Clay	15	Organic	5		0	Pool	Slow
2	Silt	60	Gravel	30	Clay	5	Organic	5	Pool	Slow
3	Silt	80	Organic	15	Clay	5			na	
4	Silt	50	Clay	35	Organic	15		0	Pool	None
5	Silt	40	Gravel	40	Clay	10	Organic	10	Pool	Slow
6	Silt	85	Organic	15		0		0	Pool	Slow
7	Silt	80	Organic	10	Clay	10		0	Pool	Slow
8	Silt	85	Organic	15		0		0	Pool	None
9	Silt	40	Sand	40	Organic	20		0	Pool	None
10	Organic	60	Silt	40		0		0	Pool	Slow
11	Sand	70	Silt	20	Organic	10		0	Pool	Slow
12	Gravel	80	Sand	15	Silt	5		0	Pool	Slow
13	Clay	80	Gravel	15	Silt	5		0	Riffle/Run/Pool	Slow/Medium
14	Gravel	60	Sand	25	Clay	15		0	Pool	None
15	Gravel	60	Sand	25	Clay	15		0	Pool	None
16	Silt	50	Organic	50		0		0	Pool	None
17	Silt	50	Organic	50		0		0	Pool	None
18	Silt	50	Organic	50		0		0	Pool	None
19	Silt	50	Organic	50		0		0	Pool	None
20	Silt	50	Organic	50		0		0	Pool	None
21	Silt	50	Organic	50		0		0	na	
22	no data collected								Pool	None
23	Silt	50	Organic	50		0		0	Pool	None
24	Silt	50	Organic	50		0		0	Pool	Slow

Appendix 5. Summary of riparian vegetation for 2004 Lyons Creek sampling. Map # corresponds to Figure 1. na – not available

Map#	Air Temp (°C)	Water Temp (°C)	Secchi Depth (m)	Cond (µS)	Riparian Veg Type1	Riparian Veg 1 (%)	Riparian Veg Type2	Riparian Veg 2 (%)	Riparian Veg Type3	Riparian Veg 3 (%)
1	23.9	20.5	na	125	None	50	Deciduous	40	Grasses	10
2	24.7	22	na	145	Grasses	70	Deciduous	30		
3	30.5	23.4	na	131	Grasses	80	Deciduous	20		
4	29.7	23.5	na	130	Grasses	60	Deciduous	30	None	10
5	32.5	22.5	na	160	Grasses	50	Deciduous	30	None	20
6	31.3	22.6	na	137	Grasses	90	Deciduous	10		0
7	32.2	21.6	na	140	Grasses	80	Deciduous	20		0
8	26.8	22.7	na	161	Grasses	80	Deciduous	10	Shrubs	10
9	26.1	22	na	154	Grasses	90	Deciduous	10		0
10	25.6	21.2	na	172	Grasses	40	Deciduous	40	Shrubs	20
11	25.5	20.2	na	165	Deciduous	60	Grasses	40		
12	32.9	23.4	na	149	Deciduous	85	Grasses	15		0
13	27.3	19.5	na	151	Grasses	50	Shrubs	30	Deciduous	20
14	26.5	18.1	na	170	Grasses	60	Deciduous	40		
15	26.5	18.1	na	170	Grasses	60	Deciduous	40		
16	na	na	0.67	na	None	60	Grasses	20	Deciduous	20
17	na	na	na	na	None	55	Deciduous	25	Grasses	20
18	na	na	0.60	na	Grasses	70	None	20	Deciduous	10
19	na	na	0.40	na	Grasses	70	None	20	Deciduous	10
20	na	na	0.70	na	Grasses	80	Deciduous	10	None	10
21	na	na	na	na	Grasses	100				0
22	no data collected									
23	na	na	na	na	None	60	Grasses	20	Deciduous	20
24	na	na	na	na	Grasses	70	Deciduous	20	None	10

Appendix 6. Summary of species collected by site in the 2004 Lyons Creek sampling. Scientific and common names according to Nelson et al. (2004). Sites 1-24 correspond to numbers on Figure 1. COSEWIC status **SC** – Special Concern; **TH** – Threatened

Common Name	**Scientific Name**	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Black Crappie	*Pomoxis nigromaculatus*	**4**					1			1				
Bluegill	*Lepomis macrochirus*	**22**	1				6	2	1			1	2	
Bluntnose Minnow	*Pimephales notatus*	**56**			10	5	9				1			
Bowfin	*Amia calva*	**7**					2						3	
Brown Bullhead	*Ameiurus nebulosus*	**5**						1						
Central Mudminnow	*Umbra limi*	**6**											1	
Common Carp	*Cyprinus carpio*	**5**					1		1	1			2	
Emerald Shiner	*Notropis atherinoides*	**33**	21	2	1	1		4					1	
Fathead Minnow	*Pimephales promelas*	**6**	1											
Golden Redhorse	*Moxostoma erythrurum*	**2**					2							
Golden Shiner	*Notemigonus crysoleucas*	**84**	1				9	11	8	3	16	3	4	1
Goldfish	*Carassius auratus*	**15**												
Grass Pickerel **SC**	*Esox americanus vermiculatus*	**24**						2		2	1			
Green Sunfish	*Lepomis cyanellus*	**16**												
Johnny Darter	*Etheostoma nigrum*	**4**	1		1		1							
Lake Chubsucker **TH**	*Erimyzon sucetta*	**5**												
Largemouth Bass	*Micropterus salmoides*	**49**	1		1	1	10	4	20	1		1	1	
Northern Pike	*Esox lucius*	**7**			1		1					1	1	
Esox Sp	*Esox* sp.	**1**				1								
Pumpkinseed	*Lepomis gibbosus*	**173**		2	9	18	19	5	6	1	3		7	
Rock Bass	*Ambloplites rupestris*	**8**							1	1			1	
Rudd	*Scardinius erythrophthalmus*	**2**							2					
Spottail Shiner	*Notropis hudsonius*	**7**			7									
Striped Shiner	*Luxilus chrysocephalus*	**9**	6											
Tadpole Madtom	*Noturus gyrinus*	**5**												
White Crappie	*Pomoxis annularis*	**2**											2	
White Sucker	*Catostomus commersonii*	**7**												
Yellow Perch	*Perca flavescens*	**12**				1	4	1	1			1	2	
Total		**576**	**32**	**4**	**30**	**27**	**65**	**30**	**40**	**10**	**21**	**7**	**27**	**1**

Appendix 6. Continued

Common Name	Scientific Name	Total	13	14	15	16	17	18	19	20	21	22	23	24
Black Crappie	*Pomoxis nigromaculatus*	**4**										2		
Bluegill	*Lepomis macrochirus*	**22**		1		2	3	1	2					
Bluntnose Minnow	*Pimephales notatus*	**56**				5	13	3	8	2				
Bowfin	*Amia calva*	**7**	2											
Brown Bullhead	*Ameiurus nebulosus*	**5**	1	1		1							1	
Central Mudminnow	*Umbra limi*	**6**			1		2		1	1				
Common Carp	*Cyprinus carpio*	**5**												
Emerald Shiner	*Notropis atherinoides*	**33**				1		1		1				
Fathead Minnow	*Pimephales promelas*	**6**					1		4					
Golden Redhorse	*Moxostoma erythrurum*	**2**												
Golden Shiner	*Notemigonus crysoleucas*	**84**			1	7	6		2	8			4	
Goldfish	*Carassius auratus*	**15**				8	3	1	1	2				
Grass Pickerel **SC**	*Esox americanus vermiculatus*	**24**	7		4	2	1	3		1				1
Green Sunfish	*Lepomis cyanellus*	**16**	8	4					1			2		1
Johnny Darter	*Etheostoma nigrum*	**4**	1											
Lake Chubsucker **TH**	*Erimyzon sucetta*	**5**				1	1	1	1	1				
Largemouth Bass	*Micropterus salmoides*	**49**	1			2	2	1	1		1			1
Northern Pike	*Esox lucius*	**7**			3									
Esox Sp	*Esox* sp.	**1**												
Pumpkinseed	*Lepomis gibbosus*	**173**	16	30	12	11	8	3	2	3		18		
Rock Bass	*Ambloplites rupestris*	**8**	4		1									
Rudd	*Scardinius erythrophthalmus*	**2**												
Spottail Shiner	*Notropis hudsonius*	**7**												
Striped Shiner	*Luxilus chrysocephalus*	**9**	3											
Tadpole Madtom	*Noturus gyrinus*	**5**	1									4		
White Crappie	*Pomoxis annularis*	**2**												
White Sucker	*Catostomus commersonii*	**7**	4				1		1		1			
Yellow Perch	*Perca flavescens*	**12**		1		1								
Total		**576**	**48**	**37**	**22**	**41**	**41**	**14**	**24**	**19**	**2**	**26**	**5**	**3**

Appendix 7. Fish species captured during Royal Ontario Museum sampling in Lyons and Tea Creeks 1950-1996. Site numbers correspond to site descriptions in Appendix 8.

Common Name	Scientific Name	1	2	3	4	5	6	7	8	9	10	11	12
Black Bullhead	*Ameiurus melas*												
Black Crappie	*Pomoxis nigromaculatus*										*		
Bluegill Sunfish	*Lepomis macrochirus*												
Bluntnose Minnow	*Pimephales notatus*		*										
Brown Bullhead	*Ameiurus nebulosus*												
Central Mudminnow	*Umbra limi*												
Common Shiner	*Luxilus cornutus*				*								
Common Carp	*Cyprinus carpio*												*
Emerald Shiner	*Notropis atherinoides*				*			*					
Golden Shiner	*Notemigonus crysoleucas*	*											
Grass Pickerel	*Esox americanus vermiculatus*								*		*		
Greater Redhorse	*Moxostoma valenciennesi*												
Johnny Darter	*Etheostoma nigrum*												
Lake Chubsucker	*Erimyzon sucetta*											*	
Largemouth Bass	*Micropterus salmoides*												
Mimic Shiner	*Notropis volucellus*			*									
Pumpkinseed	*Lepomis gibbosus*								*				
Rainbow Darter	*Etheostoma caeruleum*												
Rock Bass	*Ambloplites rupestris*												
Spottail Shiner	*Notropis hudsonius*									*			
Striped Shiner	*Luxilus chrysocephalus*												
Tadpole Madtom	*Noturus gyrinus*										*		
Yellow Bullhead	*Ameiurus natalis*										*		
Yellow Perch	*Perca flavescens*					*	*						
White Sucker	*Catostomus commersonii*												

Appendix 7. Continued

Common Name	Scientific Name	13	14	15	16	17	18	19	20	21	22	23
Black Bullhead	*Ameiurus melas*				*							
Black Crappie	*Pomoxis nigromaculatus*											
Bluegill Sunfish	*Lepomis macrochirus*				*	*		*	*	*		*
Bluntnose Minnow	*Pimephales notatus*	*							*			
Brown Bullhead	*Ameiurus nebulosus*		*									
Central Mudminnow	*Umbra limi*				*	*	*					
Common Shiner	*Luxilus cornutus*											
Common Carp	*Cyprinus carpio*	*										
Emerald Shiner	*Notropis atherinoides*											
Golden Shiner	*Notemigonus crysoleucas*				*	*		*				
Grass Pickerel	*Esox americanus vermiculatus*				*		*	*				
Greater Redhorse	*Moxostoma valenciennesi*						*					
Johnny Darter	*Etheostoma nigrum*						*	*				
Lake Chubsucker	*Erimyzon sucetta*											
Largemouth Bass	*Micropterus salmoides*					*	*	*	*			
Mimic Shiner	*Notropis volucellus*											
Pumpkinseed	*Lepomis gibbosus*		*		*	*	*	*	*	*	*	
Rainbow Darter	*Etheostoma caeruleum*							*				
Rock Bass	*Ambloplites rupestris*						*	*				
Spottail Shiner	*Notropis hudsonius*	*										
Striped Shiner	*Luxilus chrysocephalus*			*								
Tadpole Madtom	*Noturus gyrinus*											
Yellow Bullhead	*Ameiurus natalis*											
Yellow Perch	*Perca flavescens*					*						
White Sucker	*Catostomus commersonii*				*	*						

Appendix 8. Description of sites sampled in Lyons Creek by the Royal Ontario Museum from 1950-1996. na – not available

2004 Map #	Historic Site #	Waterbody	Site Description	Agency	Latitude	Longitude
7, 8, 9, 11	1	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.03575	-79.11595
7, 8, 9, 11	2	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.02878	-79.10900
7, 8, 9, 11	3	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.02945	-79.11283
7, 8, 9, 11	4	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.03044	-79.11185
7, 8, 9, 11	4	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.03044	-79.11185
7, 8, 9, 11	5	Lyons Creek	Lyons Creek	ROM	43.03119	-79.11074
7, 8, 9, 11	6	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.03120	-79.11074
7, 8, 9, 11	7	Lyons Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.05096	-79.02264
7, 8, 9, 11	8	Tea Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	na	na
7, 8, 9, 11	9	Tea Creek	Tea Creek,Willoughby, QEW Hwy 5.6 km SW of Chippewa	ROM	43.02861	-79.10889
7, 8, 9, 11	10	Tea Creek	Tea Creek	ROM	43.03333	-79.10000
7, 8, 9, 11	11	Tea Creek	Lyons Creek, at QEW Hwy, 5.6 km SW of Chippewa	ROM	43.06667	-79.05000
na	12	Lyons Creek	Lyons Creek Stn 01	OMNR	42.93834	-79.24830
22,23	13	Lyons Creek	Lyons Creek Stn 02	OMNR	42.99508	-79.17861
7, 8, 9, 11	14	Lyons Creek	Lyons Creek tributary, near mouth of Lyons Creek, 0.5 km East Of QEW Hwy along Lyons Creek Road	ROM	43.03281	-79.10287
na	15	Lyons Creek	Lyons Creek	ROM	43.00034	-79.14039
11, 12, 14, 15	16	Tea Creek	Tea Creek, at Lemon Rd, 200 m E of Montrose Rd	ROM	42.99167	-79.12083
11, 12, 14, 15	17	Tea Creek	Tea Creek, at Schisler Rd, 3 km SSW Of QEW, 1 Km E Of Montrose Rd	ROM	43.00694	-79.11250
11, 12, 14, 15	18	Tea Creek	Tea Creek, at Willdell Rd, 1 km S of QEW	ROM	43.02500	-79.09167
11, 12, 14, 15	19	Tea Creek	Tea Creek, at QEW	ROM	43.04583	-79.10694
7, 8, 9, 11	20	Lyons Creek	Lyons Creek	ROM	43.03327	-79.10016
7, 8, 9, 11	21	Lyons Creek	Lyons Creek	ROM	43.03327	-79.10016
7, 8, 9, 11	22	Lyons Creek	Lyons Creek	ROM	43.03327	-79.10016
7, 8, 9, 11	23	Lyons Creek	Lyons Creek	ROM	43.03327	-79.10016